FR202/-RP

Flashlink 2RU frame

User manual

Rev. A

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Revision history

Current revision of this document is the uppermost in the table below.

Rev.	Repl.	Date	Sign	Change description
A	-	2014-12-03	MR	Initial release

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1 Product overview

The FR202 (-RP) frame, is a compact frame, providing space for up to 20 Flashlink modules, in addition to two fixed positions for power supply modules and one fixed position for a possible future control board.
The frame features maximum flexibility as every module comes with a dedicated back-plane module, which takes up n x 7TE spacing. The 3.5TE distance between card positions opens for connection of two Flashlink modules to one 7TE backplane. The number of backplanes with 3.5TE module distance (utilizing all 20 positions) is currently limited, but will be expanded in the future. Each frame can be controlled by a Multicon System Controller card , together with up to 7 other frames.
The sync function makes it possible to provide a common sync signal to all card positions.

Power consumption

The current draw in the Flashlink frame is limited by the power supplies. Overloading the power supplies will cause the power units to malfunction. Please read chapter 2.4 for further details!

Heat dissipation

The heat dissipation is based on convection as well as cooling by fans, and it is therefore very important not to block the warm air exhaust perforations in the chassis.

2 Specifications

2.1 General specifications

AC Power:	PWR-AC-160W AC power supply module 100-240VAC.
Redundant Power (optional):	PWR-AC-160W
Dimensions:	19'' width 2RU height
Card slots:	20 for Flashlink modules, 1 allocated for a possible future board
Power Supply slots	2.
Internal voltages:	+5V, +15V, -15V.
Sync:	Return loss; typical <14dB, 0-5MHz (dependent of the quality of the termination at Power C5)
GPI:	Open drain output from each power supply which turns low ohmic in an alarm situation. To withstand +10VDC (open) and 100mADC (at less than 50mOhm) (closed)

2.2 Front view

The front view of the frame shows status LEDs for the power supply modules.

Figure 1:Front view of the Flashlink frame.

The two LEDs at the front have the following functions:

Upper LED: Voltage and current alarm, internal voltages

Lower LED: Fan and temperature alarm

2.3 Rear view

Figure 2 shows an example of a fully equipped Flashlink frame, seen from the rear side. The outer left and outer right modules are backplanes for the power supplies and contain connections as follows;

- Left backplane;
  - IEC-C14 AC mains inlet
  - BNC, sync in
- Right backplane;
  - IEC-C14 AC mains inlet
  - BNC, sync out
  - 2pcs. RJ-45 for RS-422 in/out
  - Rotary switch for programming frame number to be read by Multicon
  - 4 pin connector, GPI out

*The other connector modules are described in their respective user manuals.

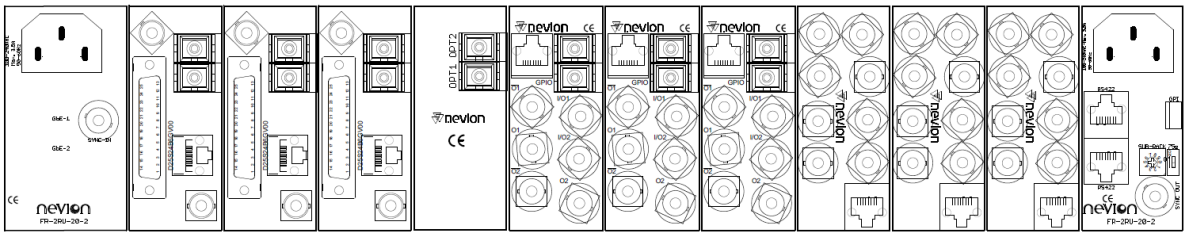


Figure 2: Illustration of fully equipped Flashlink frame.

Figure 3: Flashlink frame equipped with blanks.

2.4 Power consumption

The current draw in the Flashlink frame is limited by the power supplies. Overloading the power supplies will cause them to malfunction.

The power and current limits for the frame, even with two active power supplies, are as follows:

Total:	130W (Remaining available 30W up to 160W is dedicated for Fanboard and fans)
+5V:	20A
+15V:	8.7A
-15V:	2A

The power consumption can be drawn from the three voltages in any combination, though not exceeding 130W in total.

The sum of power for all cards on each rail must not be higher than the above listed limits. The power consumption for each of the power supply rails is found in the user manual for each Flashlink card, as this is not the same for all Flashlink cards.

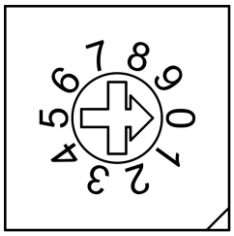
Remark:
The power supplies support load sharing giving them extended life time. Though the total potential power supply capacity is actually doubled in a redundant coupling, the above listed maximum power limits for the frame shall never be exceeded.

3 Configuration

3.1 Address setting on each frame

Each frame can be assigned an address through the rotary switches on the rear. Maximum 8 frame addresses (0-7) are available, this means that pos. “8” and “9” on the rotary switch are not valid
This address setting only applies when the frame is used in combination with a GYDA-SC Rack System Controller.
If you have more than 8 frames together, you need several GYDA-SC Rack System Controller cards.

> In order to ensure proper operation of the system, it is important that no frames controlled by the same GYDA-SC Rack System Controller card have the same address set.
>
> Reset the frame after reconfiguring the frame system, by turning the power off and on again.



Valid positions: 0-7

Figure 4: Rotary switch

More detailed information on the RS-422 configuration can be found in a separate document and at our web site: **http://www.nevion.com/**

3.2 PSU redundancy mode selection

The frame comes equipped with a jumper mounted at the programming header at the Fanboard.
Depending on the desired mode the jumper shall be mounted as described in the figure below.

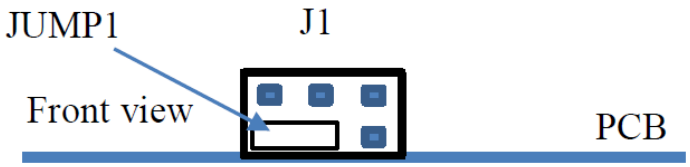


Fig. 1 Redundant power supply solution

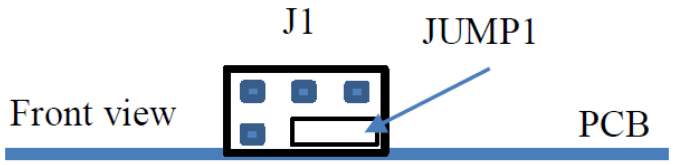


Fig. 2 Non-redundant power supply solution

Figure 5: Location of jumper for redundancy mode selection

4 Connections

4.1 Power connection

Figure 3 shows the power connections of the frame as well as the RS-422 connections and the rotary-switch for address setting of the frame.

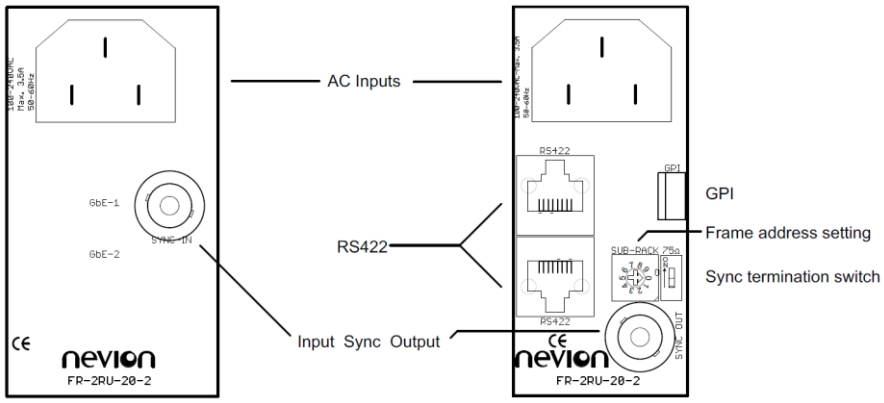


Figure 6: Connector module for the power supply.

AC: Connect mains to the frame with a mains cord with an IEC 320 connector.
To ensure a safe connection a cable with IEC-lock connector should be used.
Such cables can be ordered from Nevion.

A green LED will light on the front when the power supply is in operation mode.
For a faulty power supply LED will have red light or no light.

4.2 GPI Power Supply Status outputs

The GPI module status outputs can be used for wiring up alarms for third party control systems.

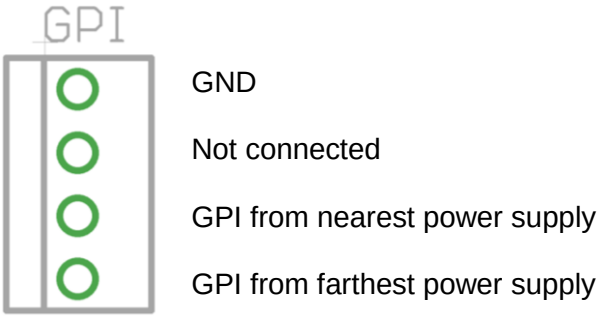


Figure 7: GPI connector

In an alarm situation the GPI output is connected low ohmic to GND.

4.3 RS-422 connection

At the rear end of the frame is an RS-422 bus. When used in combination with the Multicon Rack System Controller, up to 8 frames can be controlled. On the rear end of the frame is a rotary switch by witch each frame can be assigned its own address (see figure 3).
The RS-422 interface is shown in figure 8.

4.3.1 Pin-out RS-422 (RJ45)

Pin #1	Rx A (+)
Pin #2	Rx B (-)
Pin #3	Tx A (+)
Pin #4	Reserved
Pin #5	Reserved
Pin #6	Tx B (-)
Pin #7	Not Connected
Pin #8	Not Connected

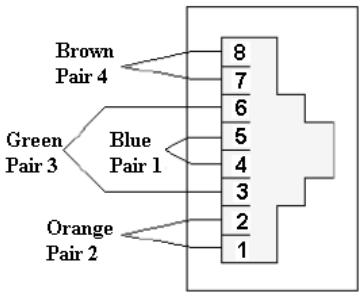


Figure 8: RS-422 pin-out.

4.3.2 Connecting several frames together

Several frames can be connected to each other through the RS-422 ports on the rear of each frame.
One GYDA-SC controller can control maximum 8 frames.
You start with the frame containing the GYDA-SC Rack System Controller, and use 1 RS-422 port to loop through to the next.
The last frame connected must be terminated with 110Ω in order to ensure proper operation. The other port of the rack containing the GYDA-SC controller must be left open, and cannot be connected to other frames.
Figure 5 shows an example of how to connect 8 frames together as seen from the rear end. By using the RS-422 interface at the GYDA-SC controller card, we control 8 frames via one RS-422 bus.

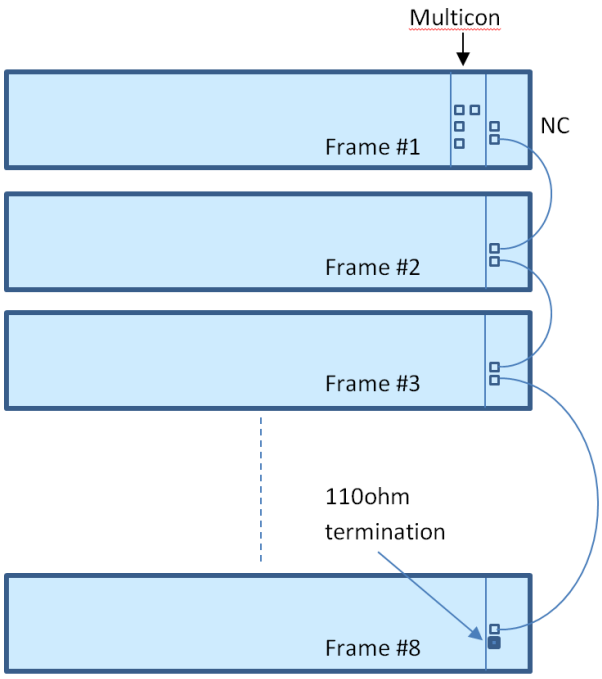


Figure 9: Control of 8 frames with GYDA-SC.

The 110Ω termination plug used is a standard RJ45 plug with the following internal wiring:

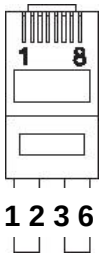


Figure 10: RS-422 termination.

In the figure above, *Pin 1* is connected to *Pin 2* with a 110Ω resistor, and *Pin 3* is connected to *Pin 6* with a 110Ω resistor.

4.4 Sync input/output.

An analog sync signal may be applied to the frame via the “Sync in” BNC connector .Which Flashlink modules that can utilize the sync signal, is described in user manual for the actual modules.
While sync is applied, the sync termination switch must be switched to “on” (upper) position).

5 Frame operation

In order to reconfigure or expand the number of modules within a frame, the front panel must be removed. Each module has a corresponding connector module at the rear, and is hot swappable.

> Use safety goggles when hot-swapping module cards.
>
> If a receiver card is removed from the frame, an invisible laser beam may be emitted inside the frame from the laser at the other end. The laser beam might be harmful to your eyes.

5.1 Removing the front panel

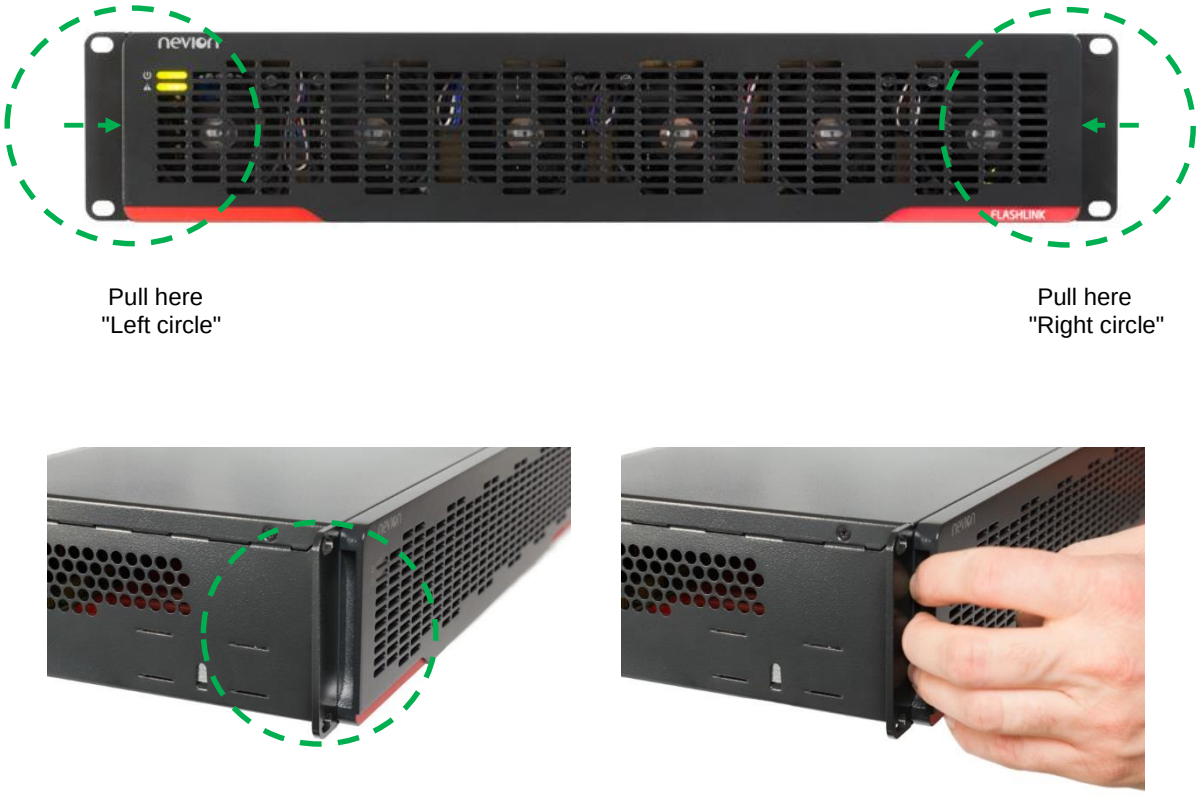


Figure 11: Removing the front panel.

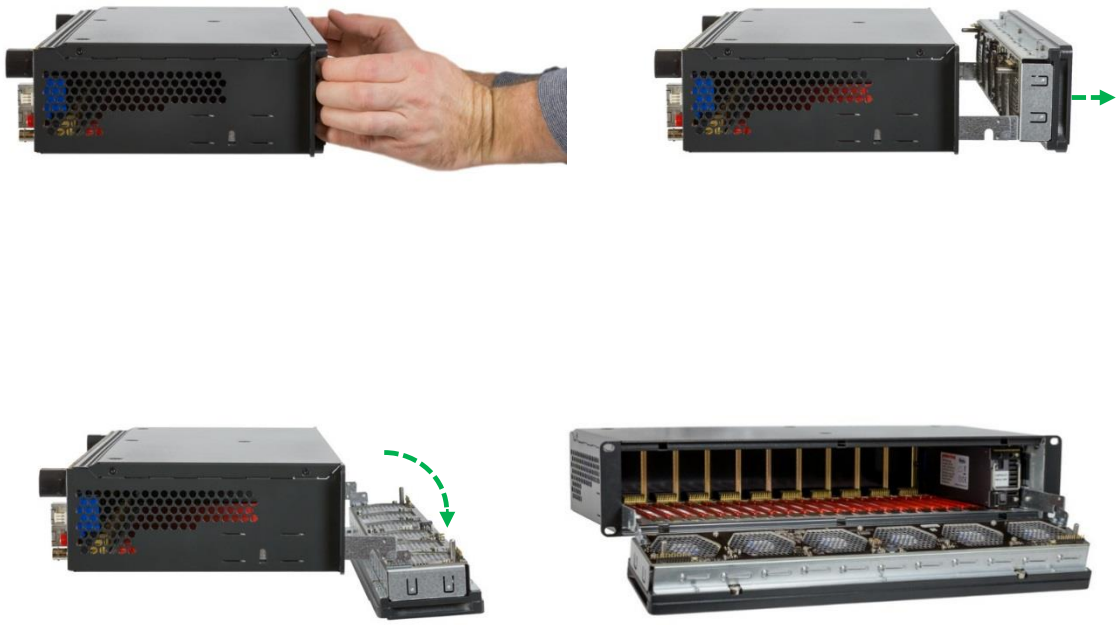


Figure 12: Removing the front panel (continued).

5.2 Backplane insertion

Before installing a new Flashlink main module, the accompanying back plane must be mounted.
Switch off the power-supply. The LED on the power module is then off. With a redundant solution, make sure that both power supplies are switched off.

Remove all screws holding the back plane to be replaced. Remove the backplane by lifting it straight out from the rear of the frame.

The backplanes with an optical interface have a rubber plug inside each fiber adapter to protect from dust. This rubber plug must be removed before the backplane is inserted.
.

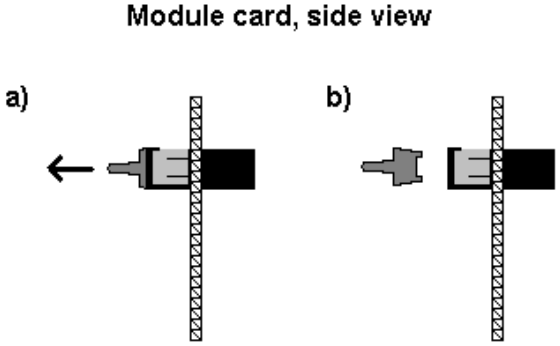


Figure 13: Removing the rubber plug from module cards.

When mounting a backplane, the backplane connector shall always be aligned at the left and upper corner pin, see figure 13 below.

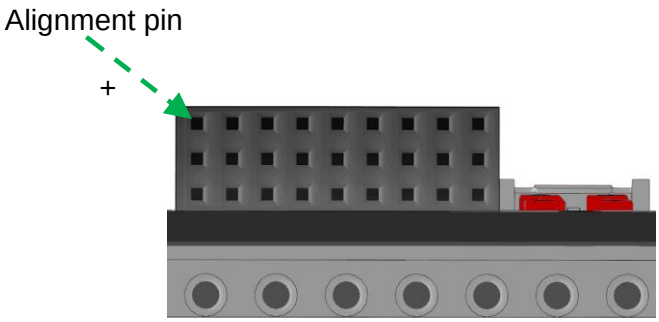


Figure 14: Alignment pin

If the backplane to be mounted has an EMC gasket of newest type (see fig. 14), the procedure described below does not apply.

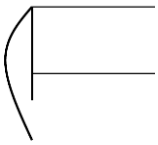


Figure 15: Newest EMC gasket solution

Remove the screws on the back plane to the left of where the new back plane is to be installed (seen from the back of the frame). Lift the right hand side of it slightly.
Insert the new back plane. Carefully place the right hand-side of the back plane into the slot first (this is the side without the EMC shielding.) Then, use your business card (or another suitable card), and insert the left edge of the back plane as shown in Figure 15 below. This will help avoid damage to the EMC shield when inserting the new back plane.

Figure 16: Inserting a new back plane.

After the backplanes are mounted, the main module can be inserted as described in section 5.3

5.3 Main module insertion

After the fan front is removed, full access to the card modules inside the frame is given. Switch off the power with the power switch at the power-supply modules. The green light -- at the power module is now switched off. If the power supply is redundant, make sure that both power supplies are off.

The frames are equipped with plastic guide rails to align the module cards into their respective positions 1 to 20. Just before a card is inserted, one should remove the plastic cap from the fiber ferrule as shown in figure 11. Do not touch the ferrule tip with your fingers (see chapter **Error! Reference source not found.** - fig. 21).

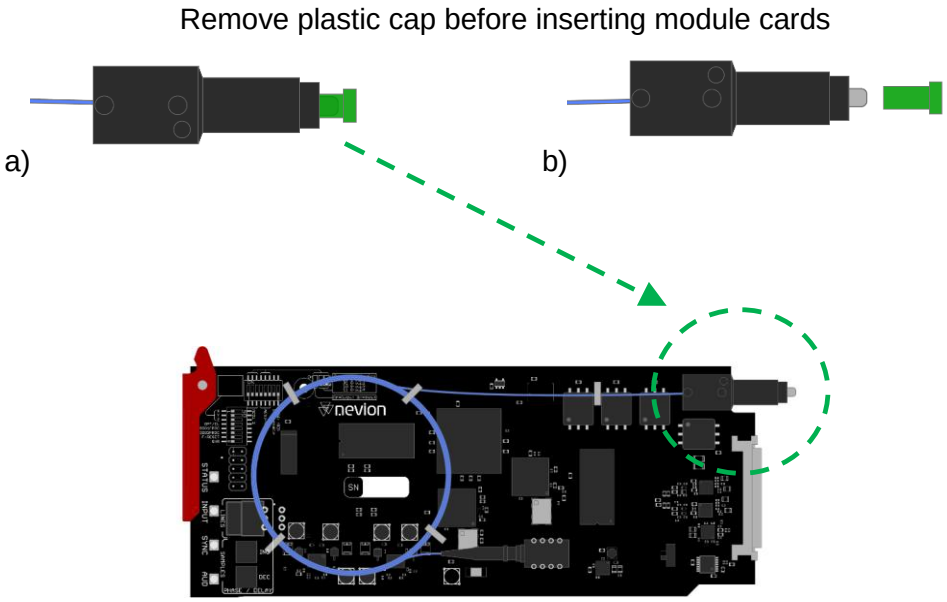


Figure 17: Removal of plastic cap

Figure 18: Open frame.

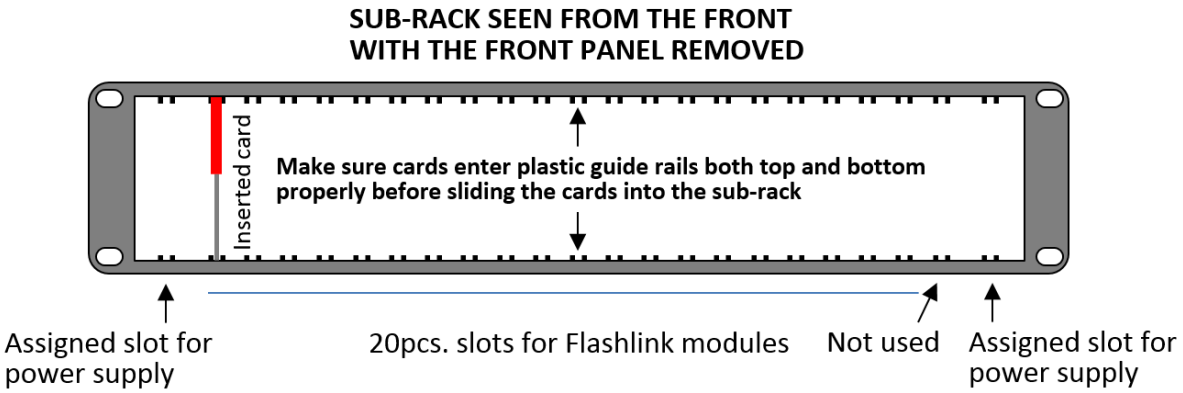

SUB-RACK SEEN FROM THE FRONT
WITH THE FRONT PANEL REMOVED
Inserted card
Make sure cards enter plastic guide rails both top and bottom
properly before sliding the cards into the sub-rack
Assigned slot for
power supply
20pcs. slots for Flashlink modules
Not used
Assigned slot for
power supply

Figure 19: Overview of card positions inside a frame

Be careful when inserting the card into the frame.

The ferrule of the fiber may be damaged if it touches the frame walls. Do not touch the ferrule tip with your fingers.

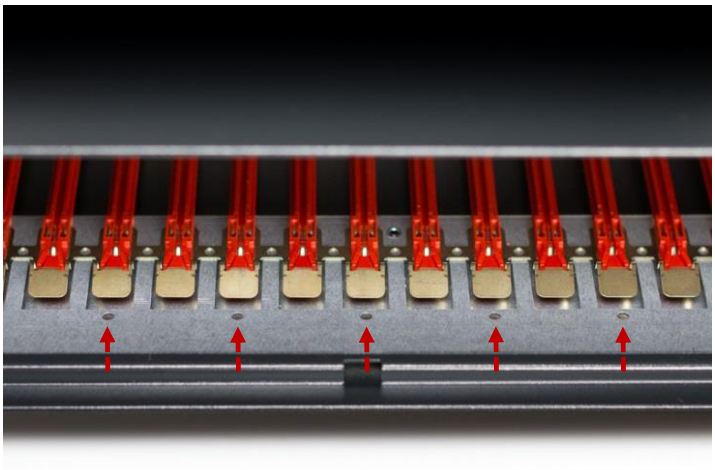


Figure 20: Marking of main module locations.

Figure 21: Inserting module cards.

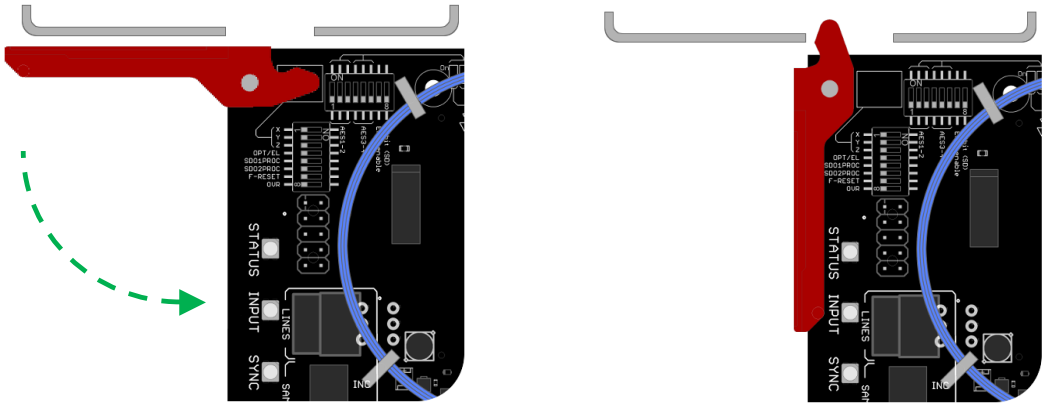


Figure 22: Inserting module cards (continued)

Slide the card into the plastic guide rails inside the frame by pushing at the card edge until the rear edge of the card is locked by the card lock at the end of the card rail. Then push the card handle into vertical position. See sketches below for detailed description.

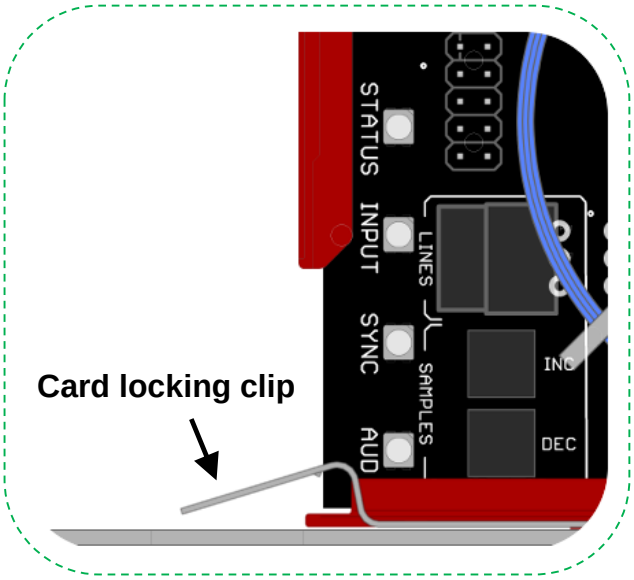


Figure 23: Inserting module cards (continued)

Make sure that the connector on the module card fits with the connector on the back plane card when inserting a new module card for the first time.

> It should not be necessary to use any force when entering the module card into the accompanying back plane connector.

5.4 Card removal

To remove a module from the frame, push the spring loaded card lock downwards and below the lower edge of the card. Then, simultaneously with the other hand, move the card handle from vertical to nearly horizontal position and pull the card entirely out of the rack.

> When removing a receiver card from the frame (hot swapping), the laser beam may be present inside the frame (transmitted through the fiber). To avoid damaging your eyes, never look directly into the frame unless you are 100% sure that no laser beam is present inside the frame.

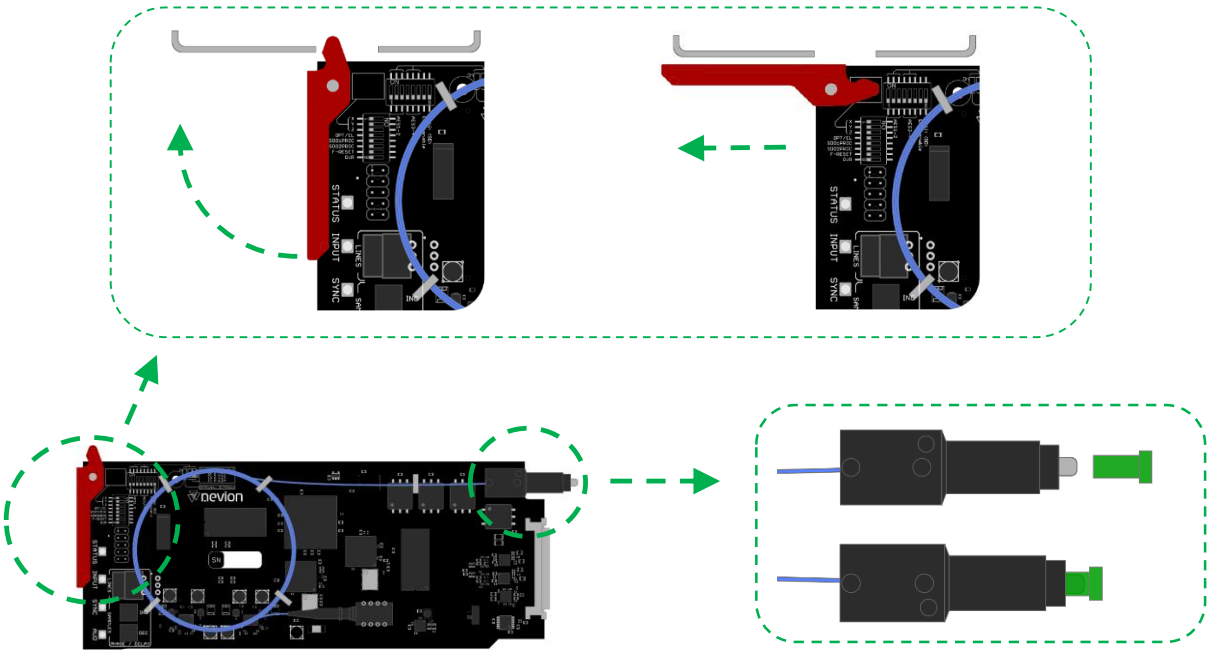


Figure 24: Card removal

5.5 PSU insertion

Figure 25: PSU insertion.

The outer left and outer right positions are allocated for PSUs.

With exception for the lacking card handle the procedure for mounting is similar to main module insertion procedure.

In a non-redundant configuration any PSU position may be used.

5.6 PSU removal

Figure 26: PSU removal

To remove a PSU from the frame, push the spring loaded card lock downwards. Be aware of the PSU connector release force.
Then, simultaneously with the other hand, move the metal handle from vertical to nearly horizontal position and pull the PSU entirely out of the rack.

5.7 Attaching the front panel

To attach the front panel, we invert the process described in section 5.1. Start by switching on the power supplies.
Then move the front to upright position and push it carefully into the frame until it stops. When correctly mounted, both LEDs at the fan front will go through a short start-up sequence before they both provide stable light.

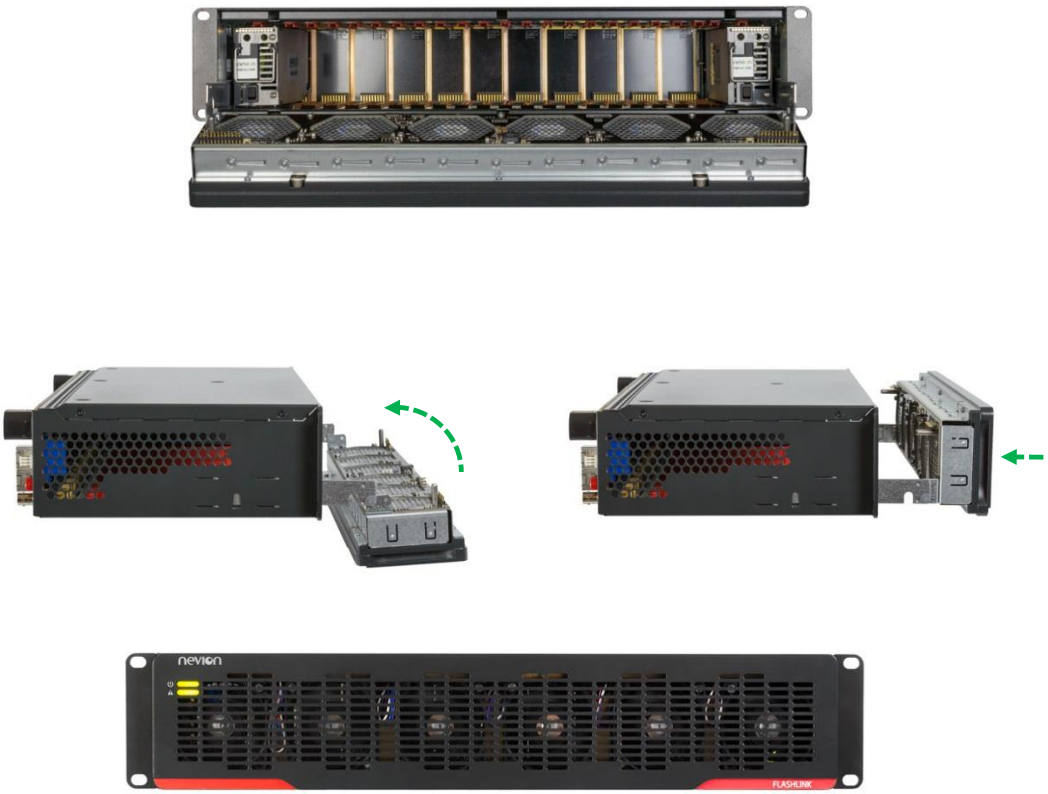


Figure 27: Attaching the front panel.

5.8 Frame status (LEDs)

PSU status is presented in the following ways:

	Symbol	Green LED	Yellow LED	Red LED	No LED
PSU module	none	Power is OK		Voltage or current alarm	Power off
Frame front	⏻	Power is OK	Communication problem with fan front*	Voltage or current alarm	Power off**
	⚠	Temperature /fans are OK	Communication problem with fan front*	Temperature /fans alarm	Power off**

* Lack of communication with PSU in non-RP mode or one of the PSU's in RP mode. (In both situations the fans will have permanent maximum speed)

** PSU in non-RP mode or both of the PSU's in RP mode

5.8.1 Multicon

- Multicon GUI which presents the following information
  - Measured voltages
  - Measured currents at each frame voltage
  - Total provided power
  - Internal PSU temperature
  - Alarm status for;
    - voltages
    - currents
    - total provided power
    - temperature
    - Defect fan

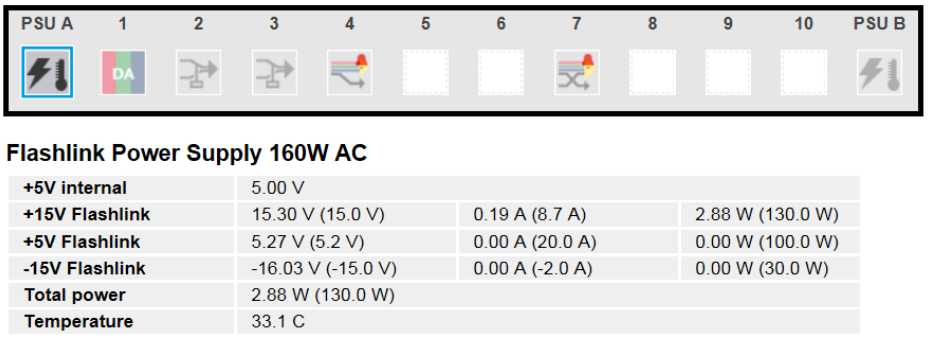


Figure 28: Example of PSU interface in Multicon

- GPI
  - See description in chapter "GPI Power Supply Status outputs".

5.9 Fans

5.9.1 Fan operation

The fans at the front provide sufficient cooling for modules and power supplies in every allowed load situation. Their speed is controlled by control circuits in the power supplies based on their internal temperature. The fan speed is individually and continuously checked, and if a fan has a speed outside expected limits, it will be reported to Multicon as being defective and the lower LED at the fan front will change to red.

Having one defective fan in the frame shall not be considered as an emergency situation since the total needed air flow will be maintained by an increase in speed for the remaining fans.
Removing the fan front in a live frame may cause malfunction or damage to modules due to excessive heat and should, as a rule, never be done.

To maintain optimal cooling, all air flow openings in the chassis must be kept uncovered.

5.9.2 Replacing defective fans

Changing a defective fan should be performed at a non-live frame.
Procedure; Please contact Nevion’s customer support department.

6 Fiber optics

6.1 Laser safety precautions

Guidelines to limit hazards from laser exposure.

All the available EO units in the Flashlink range include a laser.
Therefore this note on laser safety should be read thoroughly.
The lasers emit light at 1270 nm or 1610 nm. This means that the human eye cannot see the beam, and the blink reflex cannot protect the eye. (The human eye can see light between 400 nm to 700 nm).

A laser beam can be harmful to the human eye (depending on laser power and exposure time), therefore:

Be careful when connecting / disconnecting fiber pigtails (ends).
Never look directly into the pigtail of the laser/fiber.
Never use microscopes, magnifying glasses or eye loupes to look into a fiber end.
Use laser safety goggles blocking light between 1270 nm and at 1610 nm.

Instruments exist to verify light output power: Power meters, IR-cards etc.

Dette er vel ikke helt oppdatert:
Flashlink features:
The FR202(-RP) is classified as Class 1 laser product according to EN 60 825-1:94/A11:96, and CFR Ch1(1997) Part 1040.10.
If the front panel is removed, the FR202(-RP) is classified as Class 1 laser product according to EN 60 825-1:94/A11:96, and class IIIb according to CFR Ch1(1997) Part 1040.10.
Sjekk angående denne spec:
Maximum output power: 5 mW.(Egentlig 10mW?)
Operating wavelengths: 1270 to 1610 nm

Figure 29: Laser class label

6.2 Handling of optical fibers

When handling fiber optical cables and interconnections, these precautions must be taken to ensure reliable operation:

- Do not bend the fiber too much, all fiber optical cables have a minimum bend radius. Follow manufactures datasheet recommendation for each cable or use 40 mm as a general guideline.
- Do not apply excessive mechanical stress on the fiber optical cables or connectors.
- Keep the connectors clean from dust. Good practice is to clean the ferrule each time a new connection is made between two optical connectors. Always use special fiber optical ferrule cleaner made for this purpose.
- Never touch the ferrule or make the tip of the ferrule come in contact with other objects. Always protect ferrules on optical connectors with protective cap when not in use.

If the above precautions are not taken, the optical signal may be degraded or even lost completely and the equipment will not function properly.

6.3 Optical connectors

The Flashlink product range utilizes among others SC/PC connectors.
An illustration of the different parts of the fiber optical connector are shown below.

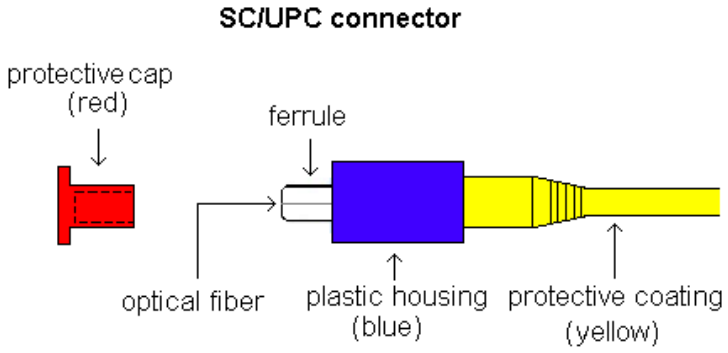


Figure 30: The different parts of an SC/PC Connector.

Clean connectors are of crucial for reliable operation.

7 Flashlink control protocol

7.1 Document conventions

All commands sent to the card are printed in *italics*.
This is a command sent to a card.
All responses sent from a card to the controller are printed in **bold**.
This is a response sent from a card to the controller.

7.2 Hardware interface

The hardware interface is basically RS-422, a serial communication standard much like RS-232 but with balanced lines. You can use a simple (dumb) RS-232 to RS-422 converter if you want to use a standard RS-232 port (eg. a PC COM port).
The receive and transmit lines can be connected to make a true RS-485 bus, but this requires special care from the PC side, since you have to control the bus direction (e.g. using a dedicated RS-485 board with RS-485 drivers). We recommend using RS-422 for control.
Data rate: 115200 bps, 8 bits, with one stop bit and no parity.
All data is 8 bit ASCII (ISO8859-1 encoding, but currently any ASCII encoding will do since no special ASCII characters are used).

7.3 Addressing

Each card has a unique identifier called card position, which is assigned (trough hardware pinning) automatically when a card is inserted into a subrack. The card positions are numbered from 1 to 20 from a user point of view. From a protocol (or software) point of view, the cards are numbered 0-19. When we refer to card position in this document, we refer to this "low level id" numbered 0-19, but the user should always see positions 1-20 in menus, etc.
Each frame (if you use more than one) should have a unique frame id, numbered 0-7 (user and protocol/software wise). The id is set by rotary switches on the rear of the rack, behind the power supply at the left side.

7.4 General command structure

Each command is built up of a sequence of ASCII characters terminated by linefeed. The first two characters are the source address (source frame id and the source card position).
Frame structure:

Byte 0	Rack ID (0-7); Destination
Byte 1	Card position (0-19); Destination
Byte 2	Rack ID (0-7); Source
Byte 3	Card position (0-19); Source
Byte 4 – n	Command or command response
Byte n+1	Linefeed (10 decimal, 0x0A hex)

If the command or command response contains a line feed, it is preceded by a backslash (\).

7.5 Card detection (hot swap)

The controller must send a "hello" command to gain control over a board, this is to make sure that the control software is aware of any card changes. After a power up or hot swap, the card does not respond to any other command than hello.

7.6 Hello command

This command establishes communication with a new unit. An example of communication with SDI-EO and SDI-OE is shown in the following. The command is short (a single question mark) to save bandwidth. The card will respond with card info. If the card is not present, the command times out.
A typical response would be:
0409?
0904EO/SDI/1310nm,-7.5dBm
hw rev 1.0
sw rev 1.0
protocol ver 1.0
This is an electrical to optical converter for SDI, with a -7.5dBm 1310nm laser. The hardware revision is ver 1.0, and the software version is ver 1.0. The protocol version is 1.0.

7.7 Electrical to optical converters

7.7.1 Hello command

An EO converter will respond to a hello command with:
0409?
0904EO/SDI/1310nm,-7.5dBm
hw rev 1.0
sw rev 1.0
protocol ver 1.0
or
0409?
0904EO/T140/1310nm,-7.5dBm
hw rev 1.0
sw rev 1.0
protocol ver 1.0

7.7.2 Info command

The card will respond to the command string "info" by sending the card status. This is a typical example.
0409info
0904laser on
SDI signal strength = 81 %
vcc = 5.04 V
laser fail: no

7.8 Optical to electrical converters

7.8.1 Hello command

An OE converter will respond to a hello command with:
0409?
0904OE/SDI/reclocking, not calibrated
hw rev 1.0
sw rev 1.0
protocol ver 1.0
or
0409?
0904OE/T140/reclocking, not calibrated
hw rev 1.0
sw rev 1.0
protocol ver 1.0
"Not calibrated" refers to the optical power measurement which is not calibrated.

7.8.2 Info command

The card will respond to the command string "info" by sending the card status. This is a typical example.
0409info
0904signal = -12.2 dBm
optical signal: yes
reclocker locked: yes
vcc = 4.97V
Note that since the optical signal strength is not calibrated, the measurement will be wrong (typ. +/- 5 dB).

General environmental requirements for Flashlink equipment

1. The equipment will meet the guaranteed performance specification under the following environmental conditions:

- Operating room temperature range: 0°C to 45°C
- Operating relative humidity range: < 90% (non-condensing)

2. The equipment will operate without damage under the following environmental conditions:

- Temperature range: -10°C to 55°C
- Relative humidity range: < 95% (non-condensing)

Product Warranty

The warranty terms and conditions for the product(s) covered by this manual follow the General Sales Conditions by Nevion, which are available on the company web site:

www.nevion.com

Appendix A Materials declaration and recycling information

A.1 Materials declaration

For product sold into China after 1st March 2007, we comply with the “Administrative Measure on the Control of Pollution by Electronic Information Products”. In the first stage of this legislation, content of six hazardous materials has to be declared. The table below shows the required information.

組成名稱 Part Name	Toxic or hazardous substances and elements					
	鉛 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr(VI))	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
<Product>	O	O	O	O	O	O
<Power supply, if delivered with unit>	O	O	O	O	O	O
O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006. X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.						

This is indicated by the product marking:

A.2 Recycling information

Nevion provides assistance to customers and recyclers through our web site http://www.nevion.com/. Please contact Nevion’s Customer Support for assistance with recycling if this site does not show the information you require.

Where it is not possible to return the product to Nevion or its agents for recycling, the following general information may be of assistance:

- Before attempting disassembly, ensure the product is completely disconnected from power and signal connections.
- All major parts are marked or labeled to show their material content.
- Depending on the date of manufacture, this product may contain lead in solder.
- Some circuit boards may contain battery-backed memory devices.